

## REMARKS

In the present Request for Continued Examination and in response to the final Office Action, amended claims and new claims are presented which are submitted to be patentably distinct over the cited art.

In particular, In the final Office Action, the Examiner rejected claim 31 as anticipated by the Shinohe et al. reference, rejected claims 16, 20 – 23, 25 – 20 (sic, should be 16, 20 – 23, 25 - 30) and 32 as obvious over the Shinohe et al and Hshieh et al. references, and rejected claim 24 as obvious over Shinohe et al. and Hshieh et al. in view of Hsu et al.

### 35 U.S.C. §102(e)

The **Shinohe et al.** reference shows one floating guard ring in Figure 12, for example. Little is said in the reference about the function of the floating guard ring. The floating guard ring of the type shown in Shinohe is of a conventional construction and is known in the art. Such floating guard rings are also known as floating field rings.

To better illustrate the function of such floating guard rings, refer to the previously submitted reference work, in particular, pages 92 – 100 of the teaching text book, “Modern Power Devices,” by B.J. Baliga, 1987, John Wiley and Sons.

In section 3.6.2 beginning on page 92, the Baliga work explains the function of floating field rings, or floating guard rings. The floating guard rings of the type shown in the cited Shinohe reference and as described in the Baliga reference are used to shift the boundary of the space charge region to the edge. The floating guard rings do not result in the charge carriers being depleted. By extending the space charge region to the outer edge, the effective curvature of the blocking pn-junction of the active region is decreased. By decreasing the

effective curvature, the break down voltage of the pn-junction of the active region is increased. This is the so-called “surface-effect”.

By contrast, the present invention is directed to an edge termination which is based on the volume effect. The volume effect, although not referred to as such, is explained in further detail in U.S. Patent No. 5,216,275, a copy of which has been submitted previously for the Examiner's review. As is apparent after review of the aforementioned patent, the effect of depleting a layer consisting of n-regions and p-regions where the n-regions and p-regions contribute to charges with opposite signs is discussed in detail. The doping concentrations of these n-regions and p-regions are designed in such a way as that the blocking condition of the whole layer is totally depleted.

The concept as discussed in the U.S. Patent No. 5,216,275 is used in the present invention in an edge termination region.

The claims of the present application define the invention in such a way that it is distinguished over the cited art of Shinohe. As such, the claim 31 is not anticipated thereby.

### **35 U.S.C. §103(a)**

Even when the teachings of Shinohe is combined with the Hshieh et al. reference alone or when the combination is considered in view of Hsu et al., the claimed invention is still not found or suggested. In particular, adding the teaching of parallel connected components of Hshieh does not make up the differences between the Shinohe reference and the present invention. Contrary to the Examiner's statements on page 4, bottom, and page 6, bottom, to page 7, top, of the final action, the conductivities and geometries of Shinohe are not set so that their free charge carriers are totally depleted when a blocking voltage is applied, even when considered in combination with Hshieh.

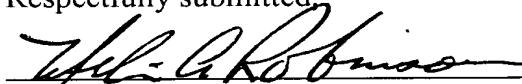
The addition of the electrode material of Hsu does not result in the combined teachings of the Shinohe reference and the Hshieh reference disclosing or even suggesting the present invention.

The present invention as claimed is thus not shown or suggested in the prior art, and therefore is a non-obvious improvement thereover.

### Conclusion

Each issue raised in the final action has been addressed. Early favorable reconsideration and allowance is hereby requested.

Respectfully submitted,

  
\_\_\_\_\_  
Melvin A. Robinson (Reg. No. 31,870)  
Schiff Hardin & Waite  
Patent Department  
6600 Sears Tower  
Chicago, Illinois 60606  
Telephone: 312-258-5785  
**CUSTOMER NO. 26574**  
ATTORNEY FOR APPLICANT

### CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service as First Class Mail in an envelope addressed to:

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

on November 10, 2003.



CHI\4068951.1